SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

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DAILY ATLANTIC WEATHER MAPS. *

Almost, if not quite, all our readers must be aware how long and earnestly we have pleaded for the preparation and publication of Daily Maps of Atlantic Weather—we give, below, references to four articles specially pleading for them, and as we assume that our readers are or can make themselves familiar with them, we say no more as to the attitude constantly maintained by this magazine.

There are, however, two statements respecting the subject, the reproduction of which is needed to complete the narrative. Both are by Mr. Symons, one, the concluding paragraph of a letter published in *The Times* of Oct. 28th, 1881, is as follows :—

As regards the study of Atlantic weather, no one desires its development more than I do. For years I have urged that we ought to have daily weather charts for the Atlantic, and the only reason that we have them not is that they would cost a few thousands per annum. This is, of course, work which lies wholly within the domain of the Government establishment, the Meteorological Office, and their accounts show that they could only establish such a system either at the cost of suppressing some of their existing observatories, or on receiving an increased vote. I think personally that Parliament could do few wiser things than to appropriate, say for five years, £4,000 per annum for that purpose. Being entirely unconnected with the Meteorological Office, and not a member of its council, this proposal may perhaps be appropriately made by

Your obedient servant,

October 27th, 1881. G. J. SYMONS, F.R.S.

The other reference is a portion of the Presidential Address to the Meteorological Society :—

I must, however, pass to a different class of subject, that of deductions as distinguished from that of instruments. First in that list I place Daily Maps of Atlantic Weather on a scale of not less than 1 inch to 300 miles. The compilation of such charts is essentially national or international work, and falls wholly within the domain of the Government office. Years ago Captain Toynbee showed us what could be done. I have long pleaded for their regular issue, and shall continue to do so, because, irrespective of their utility as contributions to Physical Geography and to Navigation, they are, I believe, the best helps towards increased accuracy in weather forecasting. I am glad to

* *Meteorological Magazine*, Volume vi. (1871), p. 86 ; Vol. xiii. (1878), p. 117 ; Vol. xiv. (1879), pp. 2 and 50.

plead this cause in the very words of the Meteorological Council, for when they published Captain Toynbee's charts they said—

"The Meteorological Council have authorised the present publication as a remainder of the work of their predecessors. It cannot be doubted that more work of the same nature as that here submitted would throw light on the atmospherical conditions which influence and determine the weather in the West of Europe."

Moreover, in thus writing, the Meteorological Council only repeated what Le Verrier had urged a dozen years previously, viz., on January 29th, 1864, when, speaking of the charts in the *Bulletin International*, and pleading for Meteorological Records from the Atlantic, he said—

"Unfortunately our charts embrace only Europe, which is not sufficient. They contain nothing of what is occurring on the surface of the ocean, and this is the more to be regretted since most of the storms which attack us seem to take their rise in those parts."

These being our views, it will readily be understood that it was with extreme pleasure that we saw in *The Times* the memorandum which we reprint verbatim at the end of this note.

We have, however to call attention to one decision of the Office, for which no reason is given, and which, at present, appears to us a mistake. Our readers are aware of the system of eight-hourly synchronous observations introduced by the Signal Office of the United States.* By this system observations are made at hundreds of stations all over the globe at the same instant of absolute time, viz., at 7 a.m., 3 p.m., and 11 p.m., Washington mean time, which is approximately synchronous with noon, 8 p.m., and 3 a.m. (of the following day) Greenwich mean time.

This system was expressly designed to facilitate and perfect the class of investigation which the Meteorological Office is now going to push forward.

On the other hand the log-books issued by the office are arranged for observations *not* synchronous, but made at fixed hours of local time, so that the observation to be made for log-book purposes at 8 a.m., local time would, off the West of Ireland, be made at 9 a.m. Greenwich time; and the corresponding 8 a.m. entry at Bermuda would be made at about 5 a.m. Greenwich time.

The memorandum asks for observations at 8 a.m., and at noon, local time; the first of these will range between 3 and 8 a.m., Washington time, and the second between 7 a.m. and noon, Washington time. The first may therefore be anything between four hours before, and one hour after the 7 a.m. Washington synchronous observations; and the second may be anything between identical with the 7 a.m. Washington Synchronous observations, and five hours after them.

Although it is possible that the total number of observations collected may be greater by adopting the system selected by the Meteorological Office, we think that the advantage so gained will be far out-weighed by the difficulties introduced by the abandonment of the synchronous principle.

Met. Mag., vol. xii. (1877) p. 37., and vol. xiv. (1879), p. 50.

We presume that it is intended that the charts shall represent the weather at noon Greenwich time, which, as we have said, may be taken as the equivalent of the 7 a.m. Washington synochronous observation, but curiously enough the memorandum ignores the synchronous observations, and does not say for what hour the charts are to be constructed.

We, however, believe the above surmise to be correct, and that the intention is to correct the 8 a.m. and noon (local time) readings to what it is believed they would have been at the hour adopted for the charts. Although we have implicit faith in the care with which this will be done under Captain Toynbee's supervision, we adhere to the opinion previously expressed, that the ignoring of the synchronous system is a mistake. Of course it will be urged that an observation to be made daily at a different time (because of the change of the ship's position), would be less easily obtained than two at fixed hours. But it would be very easy to prepare a printed table showing the time for each degree of longitude, and the fewer the corrections applied to observations the better.

DAILY WEATHER CHARTS FOR THE NORTH ATLANTIC OCEAN.

The following statement has been issued by the Meteorological Office :—

"The Meteorological Council propose to undertake the preparation of daily weather charts of the North Atlantic Ocean for the 13 months beginning on August 1 in the present year, and ending on August 31, 1883.

"It is well known that the changes of weather which we experience are in general caused by atmospheric disturbances which travel more or less rapidly, and undergo more or less modification during their progress. By far the larger number of the disturbances which visit the British Islands arrive on our shores from the Atlantic Ocean, and our earliest information as to any impending change is consequently derived from telegraphic reports from the Atlantic coasts, especially from the British stations at Stornoway, Mullaghmore, and Valentia, and occasionally from the continental observatories at Rochfort and Corunna. But of the origin and previous history of these systems we have no sufficient knowledge, except in a few isolated cases.

"The Meteorological Council believe that any systematic information which can be obtained as to the origin, development, and laws of motion of the atmospheric disturbances which occur over the Atlantic Ocean would promote the science of meteorology, and be of immediate practical utility. Such information could not fail to be a benefit to seamen traversing the Atlantic Ocean, and would tend directly to the improvement of the forecasts and storm warnings issued to the British coasts, by rendering the interpretation of the first indications of approaching changes observed at the western meteorological stations more easy and certain.

"The importance of a systematic study of the weather of the North Atlantic Ocean has long been recognized, and series of daily synoptic charts, more or less resembling those now in contemplation, have been prepared at various times, not only by the Meteorological Office, but also by the Association Scientifique de France under the guidance of Le Verrier ; by Captain Hoffmeyer, of the Danish Meteorological Institute ; by the Deutsche Seewarte, at Hamburg ; and (as a part of a wider plan) by the Chief Signal Officer of the United States. But none of these charts, however valuable in other respects, supply adequate materials for a satisfactory discussion of Atlantic weather, chiefly on account of the small number of the observations upon which they are founded as compared with the magnitude of the area over which they are spread.

"Evidence of the interest attaching to the connection between English and Atlantic weather is afforded by the efforts which have been made during the last few years by the proprietors of the *New York Herald* to transmit to England from America telegraphic predictions of approaching disturbances which (it is presumed) are founded on the reports of vessels arriving in America from the Atlantic Ocean. Reports such as these from a large number of vessels would be of great value; but the predictions taken by themselves cannot be utilised in a scientific investigation of weather.

"The Meteorological Council gratefully acknowledge the large measure of invaluable help which they have hitherto received from seamen and the shipping interest generally. But as the object now proposed can only be achieved by the voluntary co-operation of an increased number of observers, they feel justified in making a special appeal for assistance to the owners, captains, and officers of ships, and especially to the great companies whose steamers ply between this country and America. In a science which, like meteorology, is still in its infancy, every advance is attended with great difficulties, and the Council are well aware that it would be easy to be too sanguine as to the importance of the results to be obtained by the inquiry which they are about to undertake. But having regard to the loss of life and property occasioned by storms on our coasts,* they feel confident that their proposal will commend itself to the public generally, and will insure the active co-operation of those classes of the community for whose benefit it is primarily intended.

"It is proposed to ask for observations of the barometer, of open air and sea surface temperatures, wind (direction and force) and weather at 8 a.m. and noon each day, with the position of the ship at noon.

"Forms for recording the observations will be supplied by the Meteorological Office, 116, Victoria Street, London, S.W., on application to the Marine Superintendent."

The following is the appeal issued, with the suggested form to be filled up:—

METEOROLOGICAL OFFICE, LONDON.

The Meteorological Council propose to chart and discuss the weather of the North Atlantic Ocean for the 13 months beginning August 1st, 1882, and ending August 31st, 1883; and they request owners, captains, and officers of steam vessels and sailing vessels traversing the North Atlantic Ocean to assist in the work, by furnishing observations transcribed on forms of which a specimen is given below, and which will be supplied by the Office. The Council propose to discuss the observations as early as possible. The use of the forms will save much time and labour in the Meteorological Office, and it

* The wreck return published by the Board of Trade for the year ending the 30th of June, 1880 (C. 2,906), (the last published), gives on p. 20 the following list of casualties on our coasts attributable to causes connected with the weather:—

		Total Losses.	Serious Casualties.	Minor Casualties.	Total.
1879–80	Founderings ...	16	0	0	16
	Strandings	81	108	176	365
	Other causes ...	0	105	405	510
Totals for 1879–80		97	213	581	891 gross total
Totals for 1878–79		121	227	761	1,109 gross total
Totals for 1877–78		138	289	1,002	1,429 gross total
Totals for 1876–77		180	367	1,258	1,805 gross total

is believed that the transcription from the log will cause but little trouble to the observers.

OBSERVATIONS TO BE TAKEN AT SEA AT 8 A.M. AND AT NOON OF SHIP'S TIME.

Barometer and (if a thermometer is attached to it) the Attached Thermometer.—Give, if possible, a few readings in port before leaving, and in each port which you visit.

Temperature of Air in the shade on Deck (if observations can be made).

Temperature of Sea Surface (if observations can be made).

Compass Deviation (that is, the error due to the iron of the ship) on the course steered.

Wind—Direction (by compass) and Force.—The force may be expressed in words, or by the figures of Beaufort's scale, whichever the observer is in the habit of using.

Weather.—In words or by the letters of Beaufort's notation, whichever the observer is in the habit of using.

Position of Ship.—At noon only.

In the column headed "Remarks" please to enter—(1) Whenever an important change of wind occurs, the time of its occurrence, and the direction and force of the wind before and after the change; (2) Whenever a gale occurs—the lowest reading of the barometer during the gale, the time of the lowest reading, and the direction and force of the wind at that time.

METEOROLOGICAL OBSERVATIONS IN THE NORTH ATLANTIC OCEAN.

Ship's Name and Description. _____

Owner's Name and Address. _____

Captain's Name and Address. _____

Year 188... Month..... Day.	Hour.	Bar. — Mercurial or Aneroid. (a)	Attached Thermometer.	Temp. Air on Deck.	Temp. Sea Surface.	Compass Deviation (due to the iron of the ship) on the course steered. (b)	Wind. Direction by Compass. (c)	Wind. Force.	Weather.	Ship's Position at Noon.	Remarks. (1) Giving the times of important changes of wind, with the direction and force before and after the change. (2) Giving the reading of the lowest barometer during a gale and the time of its occurrence, with the direction and force of wind at that time.
1	8 a.m.									Lat.	
	Noon.									Long.	

(a) Erase "or Aneroid" if it be a mercurial barometer, and "Mercurial or" if it be an aneriod; if both are on board always record the mercurial in preference to the aneroid.

(b) The Compass Deviation on the course steered should be copied from the Deviation Card. The Variation is not asked for; the correction for it will be applied in the Office.

(c) The corrections for Deviation and Variation will be applied in the Office.

THE METEOROLOGICAL SOCIETY.

The usual monthly meeting of this Society was held on April 19th, at the Institution of Civil Engineers, 25, Great George-street, Mr. J. K. Laughton, F.R.A.S., President, in the chair. C. P. Bolton, J. Dale, Capt. G. Gaye, T. T. Marks, G. Neame, A. F. Osler, F.R.S.,

and Miss E. I. Pogson, were balloted for and duly elected Fellows of the Society.

The papers read were :—1. "Barometric Gradients—Wind Velocity and Direction—at the Kew Observatory," by G. M. Whipple, B.Sc., F.R.A.S., F.M.S., and T. W. Baker, F.M.S. For the purpose of investigating the subject of the relation of the force and direction of the wind to the distribution of barometric pressure, the authors have discussed the Kew Observations for the 5 years 1875-79. The results show that the rate at which the wind blows increases almost directly with the inclination of the gradient in an arithmetical proportion, the mean rate of increase being 1·85 mile per hour for each additional ·0025 inch of difference in the barometer readings. The authors find that the angle at which the wind crosses the line of gradient at Kew does not vary to any material extent with either the steepness of the gradient or the velocity of the wind, and also that the angle generally lies between 40° and 60°, the average of the whole series of observations giving an "angle of deviation" of 52°.

2. "On Difference of Temperature with Elevation," by George Dines, F.M.S. In this paper the author gives a summary of his observations made at Walton-on-Thames during the last six years. Two stands, not Stevenson's, but similar thereto and almost identical in size and construction, were used, one being placed on the ground, and the other on the top of the tower of the house; the bulbs of the thermometers in the former being 4 feet, and in the latter 50 feet above the ground. The results show that the average maximum temperature for every month is always greater, and the average minimum lower, near the ground than that on the tower.

A SOUTH AFRICAN HAILSTORM.

THE following letter appeared in *The Scotsman* of April 6th. A copy having been forwarded to us by Mr. F. Coventry, F.M.S., of Ketton Hall, we wrote to the Editor of *The Scotsman* for permission to see the photograph, and he most kindly sent it to us. The stones when being photographed were evidently melting rapidly, but the ten shown in the photograph are nearly uniform in size, not one is less than an inch and a half in its least diameter and they average about two inches.

According to the table given in our article, entitled, "Hailstones—Relation of Weight to Size"*—at the time they were photographed these stones weighed about $2\frac{1}{4}$ ounces; these would penetrate "corrugated iron roofs" would be "as large as hen's eggs and many even larger," and would weigh from $1\frac{1}{4}$ oz. to $2\frac{1}{2}$ oz., the statements are therefore all consistent. Indeed, considering that in the heat of a photographer's room in South Africa the stones would rapidly dissolving while the preparations were being made for taking the photograph, it seems probable that the writer has rather underestimated the size of the stones.—ED.

* *Met. Mag.*, Vol. xiv. (1879) p. 116.

A SOUTH AFRICAN HAILSTORM.

SIR,—As it may interest some of your readers, I take the liberty of furnishing you with a few particulars of a hailstorm of a most unusual character which broke over this town on the afternoon of Saturday, the 18th inst.

In the afternoon, the clouds began to gather, but nothing further was predicted than the usual thunderstorm which, at this season of the year, is generally the programme for the after-part of the day. Presently, however, a cloud of more than ordinary blackness and density appeared, and one instinctively felt that something was going to happen.

A flash of lightning, a boom of thunder, and then a hard, sharp crack on the housetops here and there, made the people in the streets look round, and they were naturally surprised and alarmed to find solid hail balls of an unusual size dropping occasionally at their feet. The streets were scarcely cleared before a most terrific hailstorm, accompanied by thunder and lightning, broke over the town. There is no figurative language used when it is said the hail came down in torrents; but what was remarkable was the unusual size of the stones, most of which were as large as hen's eggs, and many even larger. The stones weighed from 1¼ ounce to 2½ ounces. The damage done was very considerable. Glass panes were smashed in hundreds, and in some cases even corrugated iron roofs were pierced. £2000 or £3000, it is said, will scarcely cover the loss in merchandise destroyed. But what, perhaps, was more pitiable than all, was the fatal destruction carried by the storm to the gardens and vineyards, for which this town is justly celebrated. The grapes were just ripening, the figs were getting a flavour, the flowers were in their bloom. Now all was destruction, nothing scarcely was saved; and the fruit season, which had hardly begun, was over for another year.

I enclose a photograph of some hail-stones collected and photographed on the spot. I may add that the card introduced for contrast is one of the ordinary cabinet portrait size.

I may also mention that the only storm of a similar nature known in this district happened about three years ago, when similar results followed.

I am, &c.

Queenstown, South Africa, February 22, 1882. W. C.

THE ANEMOMETER EXHIBITION.

(*Concluded from page* 40).

33. **Casella's Air Meter,** for Mines, Hospitals and Public Buildings.—*L. P. Casella, F.M.S.*

Very nearly identical with No. 30.

34. **Lownde's Anemometer.**—*Elliott Bros.*

Medium-sized Robinson cups with a series of dials for indicating horizontal motion. Differing from Nos. 5 and 6 only in the arrangement of the dials.

35. **12 in. Biram's Patent Anemometer,** reading to 10 million feet.—*John Davis and Son.*

36. **6 in. Biram's Anemometer,** reading to 1,000 feet with disconnecting motion.—*John Davis and Son.*

37. **4 in. Biram's Anemometer,** reading to 1 million feet with disconnecting motion.—*John Davis and Son.*

38. **4 in. Biram's Anemometer,** reading to 100 feet.—*John Davis and Son.*

39. **2 in. Biram's Anemometer,** reading to 100 feet.—*John Davis and Son.*

40. **Biram's Anemometer,** reading to 10 million feet, with disconnector and stick holder.—*John Davis and Son.*

41. **Biram's Anemometer,** reading to 1,000 feet, with disconnector and stick holder.—*John Davis and Son.*

All these are applications of trains of dials to register the revolutions of windmill governors of various sizes; some of them were remarkably delicate. No. 39, *e.g.*, had its fans made of thin plates of mica, so as to minimise weight. Most of these patterns are chiefly used for watching the ventilation of mines.

42. **Model of a self-setting type machine,** for printing the hourly horizontal motion of the air.—*C. J. Woodward.*

This model was shown at the British Association Meeting at Exeter, 1869, and a short description appears in the volume for that year. It may be classed as a precursor of Theorell's apparatus, but in this case a good deal of work was proposed to be thrown upon the cups, which in Theorell's is effected by electricity, to the manifest diminution of the friction co-efficient.

43. **Model of Apparatus**, to be attached to Robinson's Cup Anemometer, to enable it to indicate the force of gusts.—*R. H. Curtis, F.M.S.*

44. **Specimen of Boxes**, loaded with different weights to test overthrow force of wind.—*G. Dines, F.M.S.*

45. **Floss-Silk Current Indicator**, as used by Mr. J. F. Campbell for the Committee on Warming and Ventilation, 1856-7.—*G. J. Symons, F.R.S.*

These three hardly need explanatory remarks. No. 46 was in many respects analogous to No. 23. No. 45 was merely the lightest filament of silk which could be seen, so light as to float from the end of a penholder, at whatever angle the air current might be moving. It was, in fact, another plan for attaining the same object as that aimed at by No. 31.

NEW APPARATUS.

46. **Self-Recording Rain Gauge (Casella's),** with extra open scale.—*E. Mawley, F.M.S.*

No. 46 was very nearly identical with the Casella Self-Recording Rain Gauge, described and engraved in *British Rainfall*, 1878, p. 41, but the scale is more open, it gives 1 inch for each 0·10 in.

47. **New Form of Snow Gauge.**—*E. Mawley, F.M.S.*

This is simply an 8-in. zinc cylinder 18 inches deep, having its lower end slightly raised above the ground, and closed with a double horse-hair sieve, so as to collect snow, hail, &c., in, as far as possible, an unmelted condition. This gauge does not require to be constantly emptied of rain-water like an ordinary snow cylinder; and when snow is deposited immediately after a fall of rain, as in the de-

structive snowstorm of October, 1880, its depth can be readily ascertained.

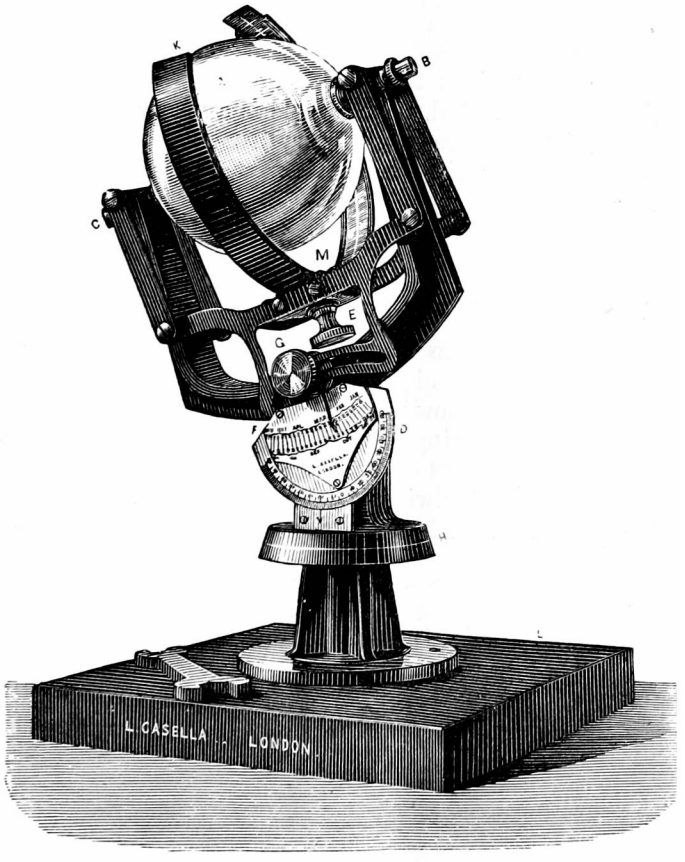
Since this gauge has been in use only one fall of snow of any importance at all has taken place. On that occasion there was more snow in the gauge than on the surface of the lawn, and it remained longer unmelted in the former than on the latter.

48. **Electrical Self-Registering Rain Gauge**, designed by S. M. Yeates.—*Yeates & Son.*

We rather doubt this being entitled to appear as a novelty; it certainly had never been shown at a meeting of the Meteorological Society, but it—or an instrument identical in principle—was in the Loan Collection of Scientific Apparatus at South Kensington, and it was described and engraved in the *Met. Mag.*, vol. xi. (1876) p. 153.

49. **Whipple-Casella Universal Sunshine Recorder.**—*L. P. Casella, F.M.S.*

Exhibited at the British Association Meeting, in August last, described in *Met. Mag.* vol. xvi. (1881), p. 158, and represented in the annexed engraving:—



A Glass sphere; B C Polar axis; D Arc for adjustment for latitude of place of observation; E Clamps of card holder; F Scale of sun's declination; G Clamp for the same; H Adjustment to the meridian; K Card holder; L Slate base; M Meridian line on card.

50. **Self-Registering Differential Solar Thermometer,** for recording the maximum Solar Intensity during a day or any other period.—*Dr. E. Frankland, F.R.S.*

Described and engraved in *Proc. Roy. Soc.*, vol. xxxiii. (1882), p. 331.

51. **Earth Thermometer for small depths.**—*E. E. Dymond, F.M.S.*

This thermometer is designed to indicate the temperature of the ground at small depths below the surface. The stem of the thermometer is bent at right angles, so that the bulb shall be at or near the required depth when the instrument has been pushed into the ground until the horizontal part is resting on the surface. The mount is made of ebonite, with a hollow iron cone screwed on at the bottom of the part entering the ground. The bulb projects below the ebonite into the hollow cone, which is filled with mercury. By this means there is metallic contact between the bulb and the ground at the depth to which the cone is pushed, and little or no conduction of heat from the surface through the instrument itself. It is not intended for use at depths of more than one foot, for which cases another arrangement has already been introduced, but it has been found much more convenient than the long straight-stemmed thermometers hitherto constructed. The scale is a very open one, and the indications can be easily read with very little stooping. A light zinc cover can be laid over the horizontal part, to keep off the rain, if it is thought desirable.

PHOTOGRAPHS, DRAWINGS, ETC.

Space will not allow us to go in detail through the thirty separate exhibits in this class. It included engravings of old anemometers, facsimiles of the records of anemometric indications on excessively open scales, photographs, tracings, drawings, and diagrams of many anemometers in different parts of Europe, and a series of maps and plans, by Mr. Symons, of whirlwinds which have passed over various parts of England, together with 37 photographs of damage produced thereby.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, NOV., 1881.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	TotalRain. Depth.	TotalRain. Days.	Aver. Cloud.
	°		°		°	°	°	0–100	°	°	inches		
England, London	62·5	5	31·9	1	54·2	43·3	44·7	85	95·2	27·2	2·75	16	7·2
Cape of Good Hope	97·9	26	43·2	14	76·9	51·9	52·9	69	...	...	1·23	9	4·3
Mauritius	80·5	var.	64·5	4	79·3	70·7	64·6	72	...	...	3·19	16	6·1
Calcutta	84·3	18	57·9	30	82·1	63·0	60·8	70	146·8	45·3	·00	0	1·7
Bombay	93·3	1	64·3	20	87·8	72·6	66·5	65	149·6	47·0	·09	3	2·9
Ceylon	88·2	15	71·0	11	85·9	74·4	72·2	77	156·0	61·0	28·78	25	7·3
Melbourne	92·0	13	43·3	5	68·9	51·5	49·3	71	136·0	35·0	5·05	15	6·5
Adelaide	103·0	27	44·2	5	76·8	53·8	46·8	50	166·5	36·0	·59	12	5·0
Wellington	70·8	8	42·0	28	63·6	50·2	...	...	142·0	39·0	1·92	8	...
Auckland	...	...	...	...	...	...	...	...	...	...	...	...	...
Falkland Isles	63·6	26	32·3	4	53·2	39·1	40·2	75	126·8	23·3	1·77	16	6·4
Jamaica	89·7	16	68·9	5	87·0	71·7	71·0	80	...	...	2·18	10	5·3
Barbados	83·0	var.	69·0	26	81·0	73·0	73·4	84	147·0	68·0	6·52	20	8·0
Toronto	62·5	8	12·4	28	44·0	30·0	36·0	79	111·0	4·0	3·26	19	7·4
New Brunswick, S. John	59·0	3	2·0	28	42·5	28·2	32·5	82	...	...	3·10	12	5·7
Cape Breton, Sydney	61·3	4	15·3	28	44·0	28·8	32·7	80	...	...	2·73	14	7·1
Newfoundlnd, S. John's	52·3	5	10·3	23	37·5	26·6	30·0	88	102·0	12·0	1·72	12	8·1
Manitoba, Winnipeg	44·8	6	—26·3	...	20·3	1·9	14·5	93	...	...	2·61	19	7·0

REMARKS, NOVEMBER, 1881.

Mauritius.—Rainfall, ·61 in. above average; mean bar., 30·046 in. Mean hourly velocity of wind, 12·1 miles; greatest, 29 miles on 18th; least, 1·6 on 26th; prevailing direction, E.S.E. to E. by N.; T on 10th, 11th and 27th.
C. MELDRUM, F.R.S.

CEYLON.—L was seen on 4 days, and TSS occurred on 19 other days.
J. STODDART.

Melbourne.—Mean temp. of air, 1°·1 below average of 23 years; pressure, humidity, and amount of cloud all about the average; rainfall, 2·82 in. above it. Prevailing wind, S.W.; strong breezes occurring on 7 days; TSS on 3 days, aurora australis on 9th. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean bar. pressure, 29·970 in., or ·016 below average of 24 years. The rainfall S. of lat. 30° was barely half the average, except in the extreme south portion of the colony; between lat. 30° and the N. coast, the rainfall was about an average; Central Australia obtaining an excess, as likewise did the neighbourhood of Port Darwin. Mean temp., 1°·5 below average. This has been a remarkably cool summer so far, the 27th being the first really hot day; on 3 days only has the temp. exceeded 90°. C. TODD.

Wellington.—Exceedingly fine, bright weather up to 18th; remainder of month showery, but some pleasant days. Prevailing wind N.W., generally moderate in force. Mean pressure and temp. both average. R. B. GORE.

BARBADOS.—Mean temp. 74°·7, 2°·3 below average. Prevailing wind N.E.; average velocity, 13·2 miles; extremes, 19·9 miles and 4·6 miles. Rainfall, 24 per cent. below the average, and evaporation 30 per cent. above it. TSS on 1st and 4th. R. BOWIE WALCOTT.

NEWFOUNDLAND.—The weather during the month was very changeable; stormy, cloudy and hazy; S on 5 days amounting to 20·5 in. Prevailing wind, W.
J. DELANEY.

CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, DEC., 1881.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	TotalRain. Depth.	TotalRain. Days.	Aver. Cloud.
	°		°		°	°	°	0–100	°	°	inches		
England, London	53·6	2	28·1	24	44·7	35·1	36·6	87	72·3	21·2	2·48	15	6·5
Cape of Good Hope	...	...	...	...	...	...	...	...	...	...	...	...	...
Mauritius	83·4	26	70·9	1	81·3	73·6	68·9	76	...	...	6·88	17	6·3
Calcutta	79·7	1	48·3	17	76·7	53·9	54·0	71	137·9	34·6	·36	2	1·0
Bombay	91·3	16	67·0	8	86·0	69·7	65·2	66	145·4	51·8	·00	0	1·5
Ceylon	88·4	6	72·6	7	85·1	74·2	72·4	79	152·0	68·0	8·57	19	7·2
Melbourne	97·1	5	46·0	10	72·5	54·0	50·3	67	136·0	41·6	3·13	11	6·5
Adelaide	105·8	4	48·2	2	82·9	57·8	48·5	46	163·5	38·4	·31	8	4·3
Wellington	73·3	26	45·2	5	65·0	54·3	...	...	143·0	41·0	5·45	12	...
Auckland	76·1	31	49·2	7†	70·6	55·5	55·9	78	149·0	49·3	3·63	16	6·8
Falkland Isles	66·6	10	33·0	31	54·1	41·2	41·4	76	128·3	26·9	3·45	24	7·2
Jamaica	89·4	13	64·4	23	85·5	68·5	68·9	82	...	...	·24	5	3·3
Barbados	81·0	3*	69·0	15	79·0	71·3	70·7	82	146·0	66·0	5·17	12	6·0
Toronto	52·1	14	12·2	31	39·9	27·4	30·0	80	101·0	5·0	2·47	18	7·7
New Brunswick, S.John	49·0	14	—1·0	16	36·7	22·0	28·0	88	...	...	5·38	16	6·4
Cape Breton, Sydney	52·2	30	12·2	17	36·6	24·2	27·0	84	...	...	4·64	13	7·9
Newfoundlnd, S.John's	48·0	31	—3·0	26	32·5	29·5	27·0	96	90·0	11·0	2·45	10	7·1
Manitoba, Winnipeg	34·5	24	—27·3	14	21·5	—2·2	12·0	92	...	...	·32	5	4·2

* And 5th. † And 8th.

REMARKS, DECEMBER, 1881.

Mauritius.—Rainfall, ·73 in. above the average; mean bar., 29·990 in. Mean hourly velocity of wind, 12·0 miles; greatest, 26·1 miles on 15th; least, 0·0 miles on 22nd; prevailing direction, E. by S. to E. by N. T and L on 10th, 16th, 17th, 18th and 21st. C. MELDRUM, F.R.S.

CEYLON.—TSS occurred on 8 days. J. STODDART.

Melbourne.—Mean temp. of air, 1°·5 below average of 23 years; mean pressure and humidity about the average; rainfall, ·80 in., and amount of cloud, 1°·0 above it. Prevailing wind, S.W.; strong breezes occurring on 7 days, and violent squalls on the 28th. Heavy dew on 4 days, TSS on 3 days. R. L. J. ELLERY, F.R.S.

Adelaide.—Mean bar. pressure, 29·932 in., ·008 in. below average of 24 years. The rainfall S. of lat. 30° was about 50 per cent. below the mean, except at a few prominent localities along the S. coast; the MacDonnell Range, in Central Australia, had, however, an amount far in excess; whereas, further N., the fall was far below the mean, being barely half at Port Darwin. Temp. was about 0°·5 below the average, and though the temp. exceeded 90° on 8 days and 100° twice, the month was remarkably cool, especially at night. C. TODD.

Wellington.—Beginning of month fine; showery and unsettled from 4th to 21st; remainder, fine and dry. 2·25 in. of R on 20th, frequently stormy after 11th. Prevailing wind N.W. Mean pressure and temp. both below the average. Earthquakes on 3rd, 23rd and 31st. R. B. GORE.

BARBADOS.—Mean temp., 75°·1, average. Wind, from N.E. on 30 days, and S.W. 1 day; average velocity, 10·8 miles per hour; extremes, 16 miles and 2·5 miles. Rainfall, 9 per cent. below, and evaporation 30 per cent. above the average. Heavy spring tides on 14th and 15th. R. BOWIE WALCOTT.

NEWFOUNDLAND.—Weather very stormy and uncertain during the whole month; about 10 fair days. Prevailing wind, W.; 18·7 in. of S falling on 7 days. J. DELANEY.

SUPPLEMENTARY TABLE OF RAINFALL, APRIL, 1882.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	3·67	XI.	Castle Malgwyn	5·33
,,	Margate, Birchington...	2·62	,,	Rhayader, Nantgwillt..	...
,,	Littlehampton	3·94	,,	Carno, Tybritle	4·66
,,	St. Leonards	2·65	,,	Corwen, Rhug	3·48
,,	Hailsham	3·95	,,	Port Madoc	4·34
,,	I. of W., St. Lawrence.	3·30	,,	I. of Man, Douglas	4·53
,,	Alton, Ashdell.....	3·85	XII.	Carsphairn	4·14
III.	Great Missenden.....	4·18	,,	Melrose, Abbey Gate...	3·82
,,	Winslow, Addington ...	3·97	XIII.	N. Esk Res. [Penicuick]	3·20
,,	Oxford, Magdalen Col...	3·78	XIV.	Ayr, Cassillis House ...	2·11
,,	Northampton	3·48	,,	Glasgow, Queen's Park.	1·99
,,	Cambridge, Beech Ho...	2·82	XV.	Islay, Gruinart School..	2·68
IV.	Southend	1·91	XVI.	Cupar, Kemback.....	4·82
,,	Harlow, Sheering	2·80	,,	Aberfeldy H.R.S.	1·75
,,	Diss	2·87	,,	Dalnaspidal	3·58
,,	Swaffham	3·03	XVII.	Tomintoul.....	2·51
,,	Hindringham	2·39	,,	Keith H.R.S.	4·48
V.	Salisbury, Alderbury...	3·96	XVIII.	Forres H.R.S.	2·96
,,	Calne, Compton Bassett	4·25	,,	Strome Ferry H.R.S....	3·09
,,	Beaminster Vicarage ...	5·39	,,	Lochbroom	2·03
,,	Ashburton, Holne Vic..	9·96	,,	Tain, Springfield.....	2·26
,,	Torrington, Langtree W.	...	,,	Loch Shiel, Glenaladale	6·87
,,	Lynmouth, Glenthorne.	4·90	XIX.	Lairg H.R.S.	...
,,	St. Austell, Cosgarne...	...	,,	Forsinard H.R.S.	2·88
,,	Taunton, Fullands	3·59	,,	Watten H.R.S.	2·19
VI.	Bristol, Clifton	4·07	XX.	Fermoy, Glenville	6·07
,,	Ross	...	,,	Tralee, Castlemorris ...	4·25
,,	Wem, Sansaw Hall.....	2·11	,,	Cahir, Tubrid	4·18
,,	Cheadle, The Heath Ho.	4·33	,,	Newcastle West	3·26
,,	Worcester, Diglis Lock	3·21	,,	Kilrush	...
,,	Coventry, Coundon	3·78	,,	Corofin	4·84
VII.	Melton, Coston	3·27	XXI.	Kilkenny, Butler House	...
,,	Ketton Hall [Stamford]	3·34	,,	Carlow, Browne's Hill..	3·75
,,	Horncastle, Bucknall ...	2·67	,,	Navan, Balrath	3·29
VIII.	Macclesfield, The Park.	3·55	,,	Athlone, Twyford	4·37
,,	Walton-on-the-Hill.....	3·56	XXII.	Mullingar, Belvedere ...	4·15
,,	Broughton-in-Furness ..	5·93	,,	Ballinasloe	3·65
IX.	Wakefield, Stanley Vic.	2·78	,,	Clifden, Kylemore	6·31
,,	Ripon, Mickley	4·78	,,	Crossmolina, Enniscoe..	...
,,	Scarborough.....	4·74	XXIII.	Carrick-on-Shannon ...	2·50
,,	East Layton [Darlington]	4·20	,,	Dowra	...
,,	Middleton, Mickleton ..	4·73	,,	Rockcorry.....	4·07
X.	Haltwhistle, Unthank..	3·23	,,	Warrenpoint	5·40
,,	Shap, Copy Hill	5·72	,,	Newtownards	3·30
XI.	Llanfrechfa Grange	5·71	,,	Belfast, New Barnsley .	4·40
,,	Llandovery	5·48	,,	Bushmills	2·76
,,	Solva	3·37	,,	Buncrana	2·89

APRIL, 1882.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1870–9	Greatest Fall in 24 hours. Dpth	Date.	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date.	Min. Deg.	Date.	No. Nights below 32°. In shade.	On grass.
			inches	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	2·83	+ ·81	1·08	25	14	65·5	21	32·6	16	0	9
II.		Maidstone (Hunton Court)...	2·37	+ ·52	·68	25	13	...	...	...	...	...	...
,,		Strathfield Turgiss	3·26	+ 1·35	·77	25	17	...	...	...	...	...	...
III.		Hitchin	3·14	+ 1·19	1·09	25	16	61·0	21	30·0	26	5	...
,,		Banbury	4·00	+ 1·99	·83	29	19	63·0	21	28·0	16	2	...
IV.		Bury St. Edmunds (Culford)	3·55	+ 1·76	·95	25	17	61·0	20*b*	28·0	15	5	...
,,		Norwich (Cossey)	3·19	+ 1·33	·96	25	17	66·0	21	30·5	16	3	8
V.		Bridport	...	...	...	...	...	..	..	...	...	...	...
,,		Barnstaple.....	4·94	+ 2·56	·63	21	23	65·0	14	37·0	1	0	...
,,		Bodmin	7·05	+ 3·72	1·16	12	22	61·0	8	34·0	11	0	9
VI.		Cirencester	4·36	+ 1·96	·86	25	18	...	...	...	...	...	...
,,		ChurchStretton(Woolstaston)	2·92	+ ·60	·52	29	20	61·5	19	29·0	16	3	6
,,		Tenbury (Orleton)	3·74	+ 1·57	·87	29	19	64·2	20	27·5	16	4	7
VII.		Leicester	3·02	...	·60	29	19	65·1	21	29·0	16	1	14
,,		Boston	2·48	+ ·59	·54	28	14	66·0	21	32·0	16	...	...
,,		Grimsby.....	3·67	+ 1·91	·80	13	18	64·0	21	31·5	16	1	...
,,		Mansfield	3·54	+ 1·51	·95	14	16	60·0	21	32·0	16	1	...
VIII.		Manchester (Ardwick).....	...	...	...	...	...	...	...	...	...	...	...
IX.		Wetherby (Ribstone Hall) ...	3·77	+ 1·26	1·08	14	11	...	...	...	...	...	...
,,		Skipton (Arncliffe)	6·63	+ 3·57	·90	13	19	61·0	21	27·0	15	4	...
X.		North Shields	3·04	+ 1·04	·80	13	20	63·5	20	26·5	16	3	4
,,		Borrowdale (Seathwaite).....	10·08	+ 5·14	2·47	24	17	...	...	...	...	..	...
XI.	WALES.	Cardiff (Ely).....	6·09	+ 3·75	·72	12	21	...	...	...	...	...	...
,,		Haverfordwest	5·19	+ 2·37	·91	29	19	61·5	8	28·4	10	4	13
,,		Plinlimmon (Cwmsymlog)	4·73	...	1·02	29	19	...	...	...	...	...	...
,,		Llandudno.....	3·18	+ 1·30	·64	22*d*	19	61·8	13	33·5	16	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	2·87	+ ·58	·68	19	14	63·0	8	26·2	16	5	...
,,		Hawick	3·18	+ ·97	·60	13	16	...	...	...	...	...	...
XIV.		Douglas Castle (Newmains)	3·49	+ 1·61	·58	14	16	...	...	...	...	...	...
XV.		Lochgilphead (Kilmory).....	2·53	— ·10	·83	19	13	...	...	28·0	11*e*	9	...
,,		Appin (Airds)	3·54	...	...	...	...	...	...	...	...	...	...
,,		Mull (Quinish).....	4·28	...	1·13	16	16	...	...	...	...	...	.
XVI.		Loch Leven Sluices	4·40	+ 2·19	2·10	14	10	...	...	...	...	...	...
,,		Arbroath	2·73	+ ·82	1·24	13	12	60·0	20	29·0	16	2	...
XVII.		Braemar	3·42	+ 1·34	·72	16	20	61·0	8	22·0	8	14	28
,,		Aberdeen	3·33	...	·85	13	20	61·0	20	26·0	7	4	...
XVIII		Skye (Sligachan)	6·68	...	1·52	21	14	...	...	...	...	...	...
,,		Culloden	2·43	+ 1·08	·62	17	8	58·0	20	28·8	11	9	20
XIX.		Dunrobin	2·86	...	·77	11	14	59·0	20	27·0	16	6	...
,,		Orkney (Sandwick)..... ..	1·90	+ ·03	·28	22*a*	15	54·1	22	30·3	16	2	7
XX.	IRELAND.	Cork (Blackrock)	5·51	+ 2·41	·64	11	18	63·0	4, 6	29·0	15	3	...
,,		Dromore Castle	7·34	...	·83	22	23	63·0	9	31·0	15	...	...
,,		Waterford (Brook Lodge) ...	4·41	...	·68	12	18	60·0	10	26·0	9	3	...
,,		Killaloe	4·73	...	·82	19	18	65·0	20	28·0	30	4	...
XXI.		Portarlington	3·39	+ 1·36	·79	27	22	61·5	20	28·0	15	5	...
,,		Dublin (Monkstown)	...	...	...	...	...	...	...	...	...	...	...
XXII.		Galway (Queen's College) ...	3·71	+ ·88	·78	27	18	...	...	...	...	...	...
XXIII.		Waringstown	3·00	+ 1·11	·55	27	17	67·0	19	27·0	15	5	8
,,		Londonderry...	2·62	...	·33	23	18	60·0	21	34·0	16	0	8
,,		Omagh (Edenfel)	2·55	+ ·55	·38	18	22	57·0	9*c*	26·0	15	6	9

+ Shows that the fall was above the average ; — that it was below it.

a And 24. *b* And 21. *c* And 10, 11, 13, 20, and 21. *d* And 29. *e* And 27.

METEOROLOGICAL NOTES ON APRIL.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—The agricultural report of the month is very propitious. The pastures have made rapid progress since the copious rainfall; peas and beans are looking prosperous, and the orchards generally give good promise; garden strawberry in flower on 1st; felling oaks on 3rd, very early; sycamore in leaf on 8th; nightingale first heard on 10th, cuckoo on 12th; elm in leaf on 14th, horse chestnut in flower on 18th, lilac in flower and wryneck heard on 20th.

HITCHIN.—As severe a gale as that of October, 1881, occurred on the 28th.

BANBURY.—Mean temp. of the month, 46°·7; heavy TS on 2nd at Ladmarton, four miles S.W., very severe at Chipping Norton also; high wind on 22nd, 29th, and 30th; H and distant T on 30th; martins seen on 21st; hawthorn in blossom on 23rd: floods out at the end of the month.

CULFORD.—The weather was unsettled and somewhat cold; mean temp. 46°·7; high wind on 22nd and 23rd; H and distant T on 24th; very stormy on 29th.

BODMIN.—A very cold and rainy, and unsettled month; mean temp. 49°·9; a terrific but brief W.S.W. gale on 29th.

CIRENCESTER.—Rainfall considerable, but perhaps not more than was required, the previous months having been drier than usual.

WOOLSTASTON.—Mean temp. of the month, 46°·1; T and L from 2 to 3 p.m. on 2nd; S, sleet, and R on 29th; cuckoo first heard on 20th; swallows seen on 22nd.

ORLETON.—The first eleven days were cold and dry, with the exception of the second, when a sudden storm of L T and R set in at 1.30 p.m.; the remainder of the month was generally rainy, with a variable temp. and pressure. There were several severe frosts, especially that of the morning of the 16th, when the temp. fell to 27°·5. Mean temp. 1° below the average. On the 29th, after a bright morning, R commenced at 8 a.m. with a cold S.E. wind, and rapid fall of the bar. The wind was very strong and cold, and at 6 p.m., the R changed to S, which fell thickly for nearly an hour, followed by R again. The brooks were flooded, and the river Teme overflowed its banks on the following morning. The rain has checked farm operations; cherry trees began to blossom about the 2nd, the cuckoo first heard on 21st, and white-throats and willow-wrens seen on 24th.

LEICESTER.—The month was on the whole cold, and often stormy; short thunderstorm on the 24th.

GRIMSBY.—Very unsettled weather throughout; vegetation retarded by cold; farm work delayed by wet. Swallows seen on the 19th, and cuckoo heard on 29th. T L and H on 28th at noon.

ARNCLIFFE.—Lovely weather in the early part of the month, though cold at night. Heavy hail showers on 24th, snowstorm on 29th.

SEATHWAITE.—Beautiful warm weather till the 11th, remainder of the month very wet; three falls of R exceeding 1 inch in 24 hours; H on 19th; S on hills on 16th.

WALES.

HAVERFORDWEST.—First few days gloomy and wet, very fine from 6th to 12th, but with frosts at night followed by milder weather with showers; the air again became very cold about the 15th, and from that date to the end of the month cold, wet, and broken weather prevailed. Terrific gale on 28th and 29th; bar. at 1 p.m. on the latter day 28·843in. (cor. and red.); min. temp. on grass, 21°·0 on 9th.

LLANDUDNO.—The month has been true to its traditions so far as being showery, and has been very different from the corresponding month last year; rainfall this year was 3·18 in., while last year it was only ·94 in.; the number of wet days was 20 this year, in comparison with only 8 last year; polar winds on 17 days this year, and 24 last year; mean temp. 47°·1 this year, and 45°·2 last year, yet still about 1½° below the average. We had no frost this year, and last year there were 7 nights of frost; the range of temp. diurnal and monthly was this year 10°·9 and 28°·3 respectively, whilst last year the values were respectively 12°·0 and 38°·2. 134·9 hours of sunshine were registered during the month, and though several days were stormy, the weather on the whole was fine; swallow seen on the 20th, lilac in bloom on 21st, hawthorn on 25th. Very stormy on 29th.

SCOTLAND.

CARGEN.—Weather generally dull; 133 hours of sunshine, 40 hours below the average; mean temp. 1·2 below average.

HAWICK.—Cold east wind prevailed from 1st to 16th; keen frost on 9th, 10th, 14th and 15th. Rubertlaw and the lesser hills were all white with snow on the 14th and 15th. T at 6 p.m. on 22nd. The month throughout was very cold.

QUINISH.—A cold, ungenial month, but no frost. From 1st to 13th dry and fine; from 14th to 30th wet and stormy; heavy fall of wet snow on 16th.

BRAEMAR.—A very cold, unseasonable month; vegetation dormant.

ABERDEEN.—First part of the month dry, with cold easterly winds, subsequently the winds were variable, and the weather unsettled, with almost continuous rain after the 12th; rainfall consequently above the average by upwards of an inch.

CULLODEN.—The weather was dry up to the middle of the month; temp. low; land generally dry, and seed-time favourable; vegetation late.

DUNROBIN CASTLE.—Cold easterly winds during most of the month.

SANDWICK.—There were some favourable spring days during April, but some days were quite wintry with S showers. Aurora on 13th; ground white with S on 17th.

IRELAND.

CORK, BLACKROCK.—Mean temp. 48°·8; number of night frosts small. Snow on 29th; very rough night on 28th, wind pressure 23 lbs. per square foot.

DROMORE.—The wettest April on record; the first part of the month mild and genial, the latter part cold and stormy; S on the mountains during the last week; T on the 30th; mean temp. 45°·0.

WATERFORD.—The sharp frost on the 9th, and again on 15th, cut down early potatoes and even burnt young ivy leaves. Corncrake heard on 21st, cuckoo on 25th, swallows seen on 29th. H on 27th and 29th. A few flakes of S with sleet on the 29th. Comeragh mountains, Mount Linster, and Black Stairs covered with S on 29th.

WARINGSTOWN.—Grass very forward; potato planting delayed by the wet state of the ground, and will be generally very late.

LONDONDERRY.—Month mild, and generally favourable for farming operations.

EDENFEL.—With the exception of a few short intervals, the weather of the month was raw, rainy, and unfavourable to vegetation; as many and severe night frosts as in January, and more than in February or March. Summer visitants, however, arrived a week earlier than usual.